What is claimed is:

1. A polymer-clay nanocomposite comprising:

   (i) a melt-processible matrix polymer,

   (ii) a layered clay material, and

   (iii) a matrix polymer-compatible functionalized oligomer or polymer.

2. The nanocomposite of claim 1, wherein the melt-processible matrix polymer comprises a polyester, polyetherester, polyamide, polyesteramide, polyurethane, polyimide, polyetherimide, polyurea, polyamideimide, polyphenyleneoxide, phenoxy resin, epoxy resin, polyolefin, polyacrylate, polystyrene, polyethylene-co-vinyl alcohol, or a copolymer thereof, or a mixture thereof.

3. The nanocomposite of claim 1, wherein the melt-processible matrix polymer comprises a partially aromatic polyamide, aliphatic polyamide, wholly aromatic polyamide or a mixture thereof.

4. The nanocomposite of claim 1, wherein the melt-processible matrix polymer comprises poly(m-xylylene adipamide) or a copolymer thereof, isophthalic acid-modified poly(m-xylylene adipamide), nylon-6, nylon-6,6, or a copolymer thereof, EVOH or a mixture thereof.

5. The nanocomposite of claim 1, wherein the melt-processible matrix polymer comprises poly(ethylene terephthalate) or a copolymer thereof, or a mixture thereof.

6. The nanocomposite of claim 1, comprising greater than zero to about 25 weight percent of the layered clay material.

7. The nanocomposite of claim 1, comprising from about 0.5 to about 15 weight percent of the layered clay material.

8. The nanocomposite of claim 1, wherein the layered clay material comprises montmorillonite, saponite, hectorite, mica, vermiculite, bentonite, nontronite, beidellite, volkonskoite, saponite, magadite, kenyaite, or a mixture thereof.

9. The nanocomposite of claim 1, wherein the layered clay material comprises Wyoming-type sodium montmorillonite or Wyoming-type sodium bentonite.

10. The nanocomposite of claim 1, wherein the layered clay material is a free flowing powder having a cation exchange capacity from about 0.9 to about 1.5 meq/g.

11. The nanocomposite of claim 1, wherein at least 50 percent of the layered clay material is dispersed in the form of individual platelet particles and tactoids in the matrix polymer and the individual platelet particles have a thickness of less than about 2 nm and a diameter of from about 10 to about 3000 nm.

12. The nanocomposite of claim 1, wherein the functionalized oligomer or polymer and the melt-processible matrix polymer have the same monomer unit.

13. The nanocomposite of claim 1, wherein the layered clay material is treated with an organic cation.

14. The nanocomposite of claim 13, wherein the organic cation is derived from onium salt compound.

15. The nanocomposite of claim 14, wherein the onium salt compound comprises an ammonium or phosphonium salt compound.

16. The nanocomposite of claim 14, wherein the organic cation comprises an alkyl ammonium ion, alkyl phosphonium ion, polyalkoxylated ammonium ion, or a mixture thereof.

17. The nanocomposite of claim 1, wherein the melt-processible matrix polymer comprises poly(ethylene terephthalate) or a copolymer thereof, the layered clay material comprises Wyoming-type sodium montmorillonite or Wyoming-type sodium bentonite.

18. An article prepared from the nanocomposite of claim 1.

19. The article of claim 18 in the form of film, sheet, pipe, an extruded article, a molded article or a molded container.

20. The article of claim 18 in the form of a bottle.

21. The article of claim 18, having a gas permeability which is at least 10 percent lower than that of an article formed from a clay-free polymer.

22. An article having a plurality of layers wherein at least one layer is formed from the nanocomposite of claim 1.

23. The article of claim 22, wherein the nanocomposite is disposed intermediate to two other layers.

24. The article of claim 22, having one or more layers of a structural polymer.

25. A polymer-clay nanocomposite comprising:

(i) a melt-processible matrix polymer, and incorporated therein

(ii) a concentrate comprising a layered clay material and a matrix polymer-compatible functionalized oligomer or polymer.

26. The nanocomposite of claim 25, wherein the melt-processible matrix polymer comprises a polyester, polyetherester, polyamide, polyesteramide, polyurethane, polyimide, polyetherimide, polyurea, polyamideimide, polyphenyleneoxide, phenoxy resin, epoxy resin, polyolefin, polyacrylate, polystyrene, polyethylene-co-vinyl alcohol, or a copolymer thereof, or a mixture thereof.

27. The nanocomposite of claim 25, wherein the melt-processible matrix polymer comprises a partially aromatic polyamide, aliphatic polyamide, wholly aromatic polyamide or a mixture thereof.

28. The nanocomposite of claim 25, wherein the melt-processible matrix polymer comprises poly(m-xylylene adipamide) or a copolymer thereof, isophthalic acid-modified poly(m-xylylene adipamide), nylon-6, nylon-6,6, or a copolymer thereof, EVOH or a mixture thereof.

29. The nanocomposite of claim 25, wherein the melt-processible matrix polymer comprises poly(ethylene terephthalate) or a copolymer thereof, or a mixture thereof.

30. The nanocomposite of claim 25, comprising greater than zero to about 25 weight percent of the layered clay material.

31. The nanocomposite of claim 25, wherein the layered clay material comprises montmorillonite, saponite, hectorite, mica, vermiculite, bentonite, nontronite, beidellite, volkonskoite, saponite, magadite, kenyaite, or a mixture thereof.

32. The nanocomposite of claim 25, wherein the layered clay material comprises Wyoming-type sodium montmorillonite or Wyoming-type sodium bentonite.

33. The nanocomposite of claim 25, wherein the layered clay material is a free flowing powder having a cation exchange capacity from about 0.9 to about 1.5 meq/g.

34. The nanocomposite of claim 25, wherein at least 50 percent of the layered clay material is dispersed in the form of individual platelet particles and tactoids in the matrix polymer and the individual platelet particles have a thickness of less than about 2 nm and a diameter of from about 10 to about 3000 nm.

35. The nanocomposite of claim 25, wherein the functionalized oligomer or polymer and the melt-processible matrix polymer have the same monomer unit.

36. The nanocomposite of claim 25, wherein the layered clay material is treated with an organic cation.

37. A process for preparing polymer-clay nanocomposite comprising the steps of:

(i) forming a concentrate comprising a layered clay material and a functionalized oligomer or polymer, and

(ii) melt mixing the concentrate with a melt-processible matrix polymer to form a polymer-clay nanocomposite.

38. The process of claim 39, wherein steps (i) and (ii) are conducted by a batch mixing or a melt compounding extrusion process.

39. The process of claim 37, wherein the concentrate is prepared in water or a mixture of water and one or more water-miscible organic solvents comprising alcohols, ethers, acids, and nitriles.

40. The process of claim 39, wherein the water-miscible organic solvents comprise dioxane, tetrahydrofuran, methanol, ethanol, isopropanol, acetic acid, acetonitrile, or mixtures thereof.

41. The process of claim 37, wherein the functionalized oligomer or polymer and the melt-processible matrix polymer have the same monomer unit.

42. The process of claim 37, wherein the concentrate of step (i) comprises from about 20 to about 99.5 weight percent of the functionalized polymer or oligomer and from about 0.5 to about 80 weight percent of the layered clay material.

43. A nanocomposite material produced by the process of claim 37.

44. An article prepared from the nanocomposite material of claim 43.

45. The article of claim 44 in the form of film, sheet, fiber, an extruded article, a molded article, or a molded container.

46. The article of claim 44 in the form of a bottle.

47. The article of claim 44 having a gas permeability that is at least 10 percent lower than that of unmodified polymer.

48. A process for preparing a polymer-clay nanocomposite comprising:

melt mixing a layered clay material, a functionalized oligomer or polymer, and a melt-processible matrix polymer to form a polymer-clay nanocomposite material.

49. The process of claim 48, wherein the nanocomposite material comprises from about 0.5 to about 25 weight percent of the functionalized polymer or oligomer, from about 50 to about 99 weight percent of the matrix polymer, and from about 0.5 to about 25 weight percent of the layered clay material.

50. A nanocomposite material produced by the process of claim 48.

51. An article prepared from the nanocomposite material of claim 50.